Programed Instruction of Comparison of More or Fewer Things and Numbers with the Mentally Retarded

PROGRAMED INSTRUCTION ON COMPARISON OF MORE OR FEWER THINGS AND NUMBERS WITH THE MENTALLY RETARDED

By

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7 Ss for experimental group and 7 Ss for control group were selected from pupils ranging the second year grade to the fourth grade of special school for the mentally retarded. On comparison of numbers, the subjects in the experimental group learned through programmed instruction, while the subject in the control group learned through traditional special class instruction.

In comparison of two methods, it follows that the programmed instruction showed a superior effect significantly to the other. It also indicates the possibility which the programmed instruction contributes to the advancement of the scientific education for the mentally retarded.

Recentry in the field of education for the mentally retared, research workers are showing interest in the programmed instruction and several studies have been reported. Price (1963), Malpass, Hardy, Gilmore & Williams (1964) suggest that by using teaching machine, programmed instruction in an useful teaching method with the mentally retarded. Blackman and Capobianco (1965) indicated, howere, that no superiority was evidenced for the teaching machine groups as compared with the no-teaching machine groups, although greater improvement in deportment was manifested by the teaching machine groups.

The present study in an attempt to provide additional data in this area, that is, the purpose of the following investigation is to test the hypothesis: in the gain score of comparison of numbers with the mentally retarded, we can obtain more significant effects in the result of programmed instruction with teaching machine than in that of traditional special class instruction.

Method

Subjects

Fourteen mentally retarded children (7 Ss for experimental group and 7 Ss for control group) with IQ's between 50 and 78 were selected ranging from the second year grade to the fourth year grade of Miyagi Prefectural Komyo Special School for the Mentally Retarded. They showed following results: below 30 marks out of 40 marks on comparison of more or fewer things and numbers test (This test was the pre-test for our experiment and we used numbers 11–20 in it).

Table 1. Characteristic of the Subjects

Experimental group (N=7)					Control group (N=7)				
Ss	CA	MA	1Q	Pre-test	Ss	CA	MA	1Q	Pre-test
	mo.	mo.				mo.	mo.		
MK	94	72	77	24	SW	95	63	66	18
IK	121	86	71	21	KN	137	72	53	13
IT	105	71	70	12	KK	105	82	78	29
FT	138	70	51	8	UN	114	75	66	22
OK	117	84	72	23	IZ	118	84	71	16
OB	126	63	50	18	MZ	128	75	59	19
TS	124	89	72	23	MU	112	78	70	18
Range	94-138	63-89	50-77	8-24		95-137	63-84	53-78	13-29
Mean	117.9	76.4	66.1	18.4		115.6	75.6	66.1	19.3
SD	13.39	9.08	10.11	5.73		12.93	6.43	7.59	4.71

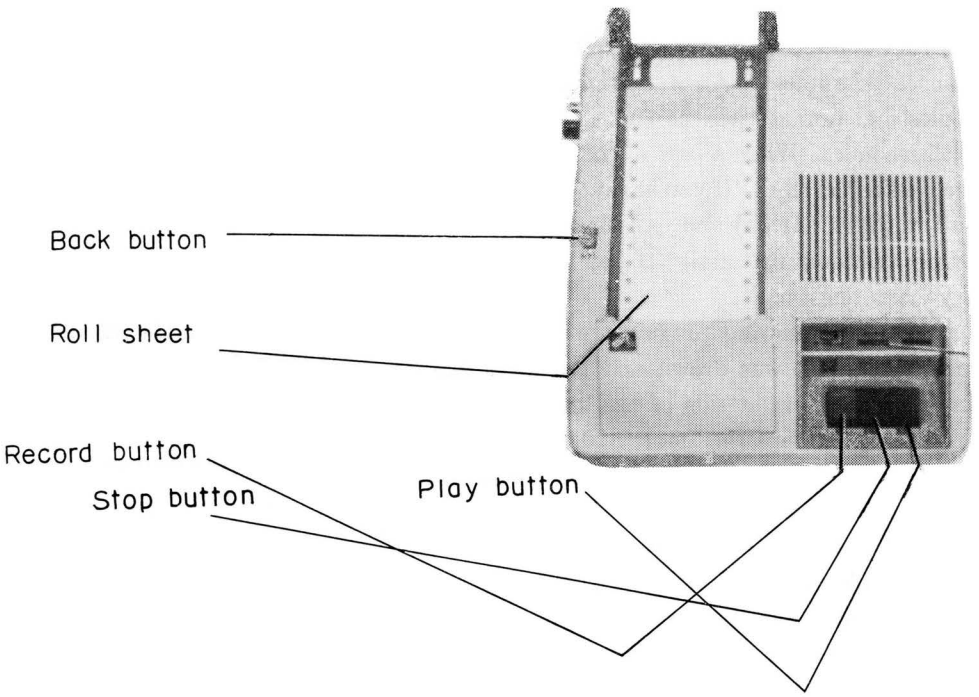

Figure 1. Victor Phonté, Model MS-I.

The group of subjects is shown in the Table I.

Apparatus

The teaching machines used in this investigation are Victor Phonté Model MS-I, designed and sold by Victor Company of Japan, Ltd. (Fig. I)

○For recording, push the "Record" button.

○To stop recording and playing, push the "Stop" button.
○For playing, push the "Paly" button.
○To rewind the roll sheet, push the "Back" button, and the roll sheet will be rewound automatically.
○Use an earphone for hearing by oneself.
○In the roll sheets, one can write letters and pictures with pen, etc. and then, one can dictate on this sheet.
○One can record continuously for two hours by this roll sheet.

Procedure

Experimental group

1. They learned comparison of numbers using Victor Phonté in programmed instruction.

2. The following instructions were recorded in the roll sheet of Victor Phonté and they were given to the subjects through an earphone. "Which are more (or fewer), oranges or apples ? Answer oranges are more (or fewer); for example." (The words apples and oranges will be changed with other materials. The materials were shown for 5 seconds. When a part of the materials were about to disappear, Subject answered the question orally.) "If you answer oranges, your answer is not correct. Push the middle button (Stop button) and call the teacher." (The teacher comes in order to mark the wrong answered material) "If you answer apples, your answer is correct. Very good ! Try next question."

3. The following programs were written in the roll sheet. In the middle of the roll sheet a line was drawn and the materials were represented pictorially or written on the left and right side of the line. The program consisted of two series. That is, there were 90 steps for "more" 90 steps for "fewer".

(1) oranges: apples (represented pictorally, we call it the half-concrete: the half-concrete)
(2) apples: blue circles (the half-concrete: figure of number)
(3) blue circles: red circles
(4) red circles: numerals
(5) numerals: numerals

Programs (1)–(5) consisted of 9 steps: 1: 10, 10: 2, 2: 9, 9: 3, 3: 8, 8: 4, 4: 7, 7: 5, 5: 6

(6) numerals: numerals

They consisted of the following 45 steps.

(1) 11:20	(2) 19:11	(3) 11:18	(4) 17:11	(5) 11:16
(6) 15:11	(7) 11:14	(8) 13:11	(9) 11:12	(10) 12:20
(11) 19:12	(12) 12:18	(13) 17:12	(14) 12:16	(15) 15:12
(16) 12:14	(17) 13:12	(18) 20:13	(19) 13:19	(20) 18:13
(21) 13:17	(22) 16:13	(23) 13:15	(24) 14:13	(25) 20:14
(26) 14:19	(27) 18:14	(28) 14:17	(29) 16:14	(30) 14:15
(31) 15:20	(32) 19:15	(33) 15:18	(34) 17:15	(35) 15:16
(36) 16:20	(37) 19:16	(38) 16:18	(39) 17:16	(40) 20:17
(41) 17:19	(42) 18:17	(43) 20:18	(44) 18:19	(45) 19:20

4. We made up the programs referring to "*Book of Number* (*Kazu no Hon*)", the text-book on arithmetic in a special school for the mentally retarded. Also we consulted "*The Guidance Book of Number*", the guidance book for teachers. In order to make up the program of our experiment, we investigated children's ability based on comparison of numbers before the pre-test. In this investigation, we used other materials which were not the same as in the pre-test and the program for our experiment. (the half-concrete: the half-concrete, the half-concrete: colored circles, colored circles: colored circles, colored circles: numerals, numerals: numerals)

Thus, according to the abilities of the metnally retarded, we tried to improve the optimal sequential order of materials as much as possible.

5. Four experiments were carried on.

The first experiment (Oct. 22, 1966)

"Which are more, oranges or apples ?" etc.

Program

(1) oranges: apples
(2) apples: blue circles
(3) blue circles: red circles
(4) red circles: numerals
(5) numerals: numerals (1–10)

The second experiment (Oct. 24, 1966)

"Which are more, 11 or 20 ?" etc. (practice of two figures)

Program

(6) numerals: numerals (11–20)

The third experiment (Oct. 25, 1966)

"Which are fewer, oranges or apples ?" etc.

Program

The materials are the same as in the first experiment.

The fourth experiment (Oct. 28, 1966)

"Which are fewer, 11 or 20 ?" etc.

The materials are the same as in the second experiment.

Control group

1. They learned comparison of numbers by traditional special class instruction.

2. The teacher asked questions to all of the subjects. The subjects who could answer it raised their hand. Then teacher asked one subject to answer. Listening to the answer, other subjects expressed orally whether the answer was correct or not. Materials were shown in the drawing paper by the teacher.

3. We made up the following problems (two series consisted of "more" and "fewer" questions and answers).

(1) oranges: apples (the half-concrete: the half-concrete)
(2) apples: blue circles (the half-concrete: circles)

(3) blue circles: red circles

(4) red circles: numerals

(5) numerals: numerals

Problems (1)–(5) consisted of representations of things or numerals such as 1: 10, 9: 2, 3: 8, 7: 4, 5: 6.

(6) numerals: numerals

1: 10, 9: 2, 3: 8, 7: 4, 5: 6, 11: 20, 19: 12, 13: 18, 17: 14, 15: 16

4. Finally, the subjects tried to exercise similar questions relating to the lesson. By patrolling through pupils, the teacher helped them to exercise.

5. The lessons above mentioned were taught four times on the same day as the experimental group were taught.

Results and Discussion

Results of the experimental and control group are shown in Table II. Difference of mean gain scores between these two groups are significant with 1% level. The results of this experiment that was conducted by two teaching methods, that is, programmed instruction and traditional special class instruction indicated that the former method was superior to the latter in the learning effect. Thus, the hypothesis was confirmed as predicated.

Table 2. Pre- and Post-test Scores and Gain Scores of Each Group

Experimental group (N=7)				Control group (N=7)					
Ss	Pre-test	Post-test	Gain	Ss	Pre-test	Post-test	Gain	Gain t	Pt
MK	24	38	14	SW	18	28	10		
IK	21	40	19	KN	13	19	6		
IT	12	28	16	KK	29	31	2		
FT	8	38	30	UN	22	17	−5		
OK	23	40	17	IZ	16	20	4		
OB	18	26	8	MZ	19	13	−6		
TS	23	40	17	MU	18	38	20		
Range	8-24	26-40	8-30		13-29	13-38	-6-20		
Mean	18.4	35.7	17.3		19.3	23.7	4.4	3.07	.01
SD	5.73	5.60	6.13		4.71	8.20	8.28		

According to Table II, all subjects in experimental group increased the post-test scores. Especially, FT increased from 8 in pre-test to 38 in post-test. This suggests that she could not grasp the meaning of "many" or "few", but, through programmed instruction using Victor Photnté, she came to understand it. On the contrary, in the control group, 5 Ss of 7 Ss increased, especially, MU increased his scores from 18 to 38, but UN, MZ decreased. This may suggest that two subjects did not sufficiently understand the sense of "many" or "few" through the traditional sepcial class instruction.

No subjects of experimental group were tired during the lessons, and participated in learning actively. On the contrary, some of the subjects in the control group grew

tired during the lessons.

The reasons why they learned earnestly in the programmed instruction are found in the following three points. First, there are two stimuli, auditory and visual for the subjects and by these stimuli, they could become less absent-minded. Second, the programs were carried on suitably and gradually according to the ability of most of the subjects. Third, the immediate feed-back right after the subjects answer helps greatly to inspire the learning effort and to reinforce the learning. The main characteristics of programmed instruction may be shown in these points above.

If we increased the steps in (1)–(5) further, the effect of this programmed instruction would be raised higher.

Of course, in the present state of studies in programmed instruction, the results are tentative. If more systematic researches are carried on in this field, it may be true that this instruction will afford unexpected effect.

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